econfidence® from DyStar

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Carpet Solutions: Polyester/Cationic Dyeable Polyester

Dyeing and printing of carpets requires specific solutions

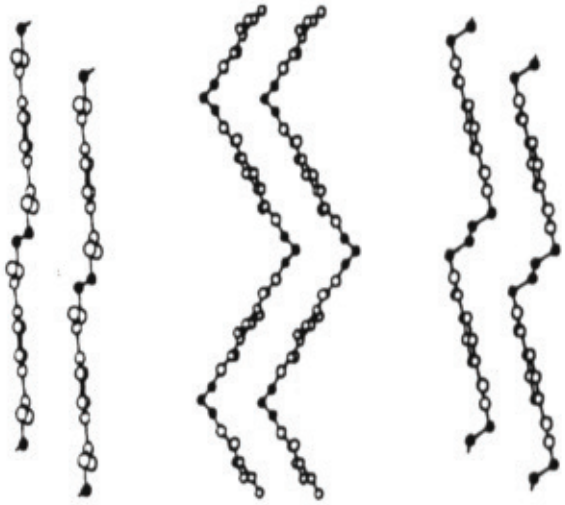
Carpet Solutions: Polyester

Polyester fibers used in carpets

Aromatic Polyester fibers

CRYSTAL STRUCTURE

PET PTT PBT

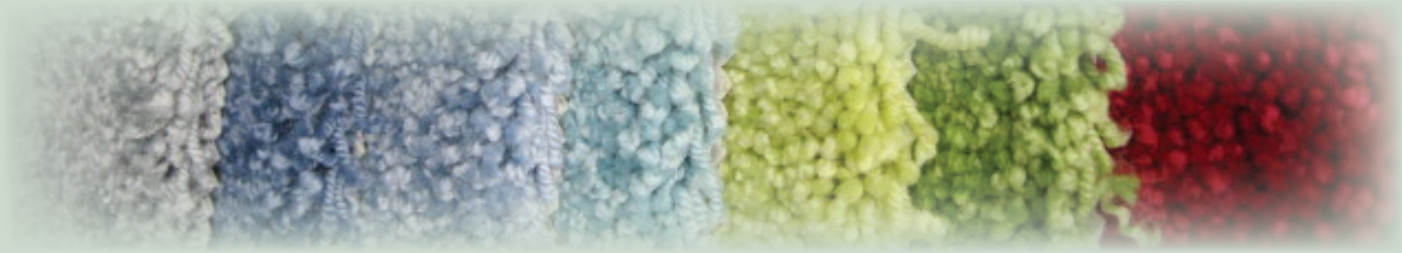


PROPERTIES

	PET	PTT	PBT
MP (°C)	265	228	225
Tg (°C)	70-80	45-65	25
Settable	yes	yes	no
Elasticity	*	***	**
Dyeing temperature (°C)	130/135	110	100

Properties of Polytrimethylene Terephthalate (PTT)

- PTT is based on terephthalic acid and propanediol
- Due to the intermediates used, PTT has a more open structure compared to PET
  - Dyeable at 110 °C
  - Excellent color build-up at 110 °C
- Compatibility with sensitive fibers, e.g. wool
- Good to excellent color fastness
- Time and energy savings in dyeing and printing
- Much better resilience of the pile compared to PET



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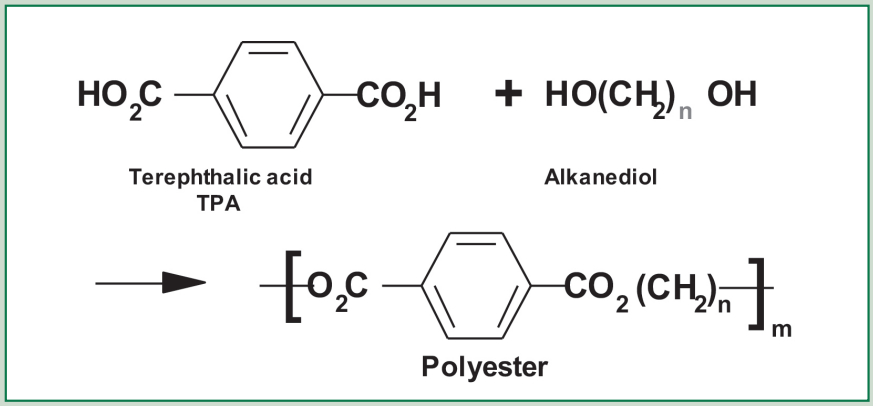
Carpet Solutions: Polyester

Dyeability of different Polyester fibers



short

Steaming time

long

high

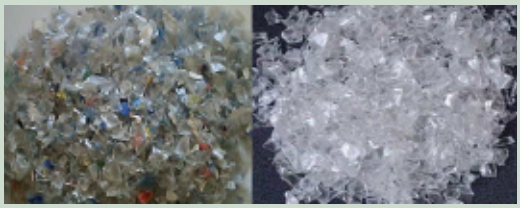
V-Value

low

PTT
TPA + Propanediol (n=3)
Polytrimethylene terephthalate

PET
TPA + Ethanediol (n=2)
Polyethylene terephthalate

Recycled PET
TPA + Ethanediol (n=2)
Polyethylene terephthalate



before and after washing

COLOR FASTNESS

	PET	PTT	Recycled PET
washing	control	slightly lower	lower
light	control	slightly lower	lower

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Carpet Solutions: Polyester

Important data for disperse dye selection

Fiber

- Each kind of PES fiber has a different dyeing rate indicated by the V-value

Steaming conditions

- Depending on V-value of the polyester fiber

  The lower the V-value:
  - The longer the steaming time
  - The more diffusion accelerator is needed

- Depending on dyestuff

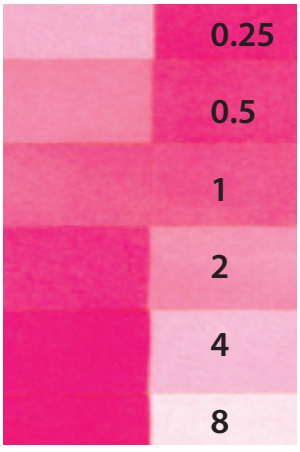
  The bigger the molecule structure:
  - The longer the steaming time
  - The more diffusion accelerator is needed

Determination of the polyester fiber dyeing rate (V-value)

Dyeing:

0.33% Dianix® Red SE-3B
1 g/l Sera Gal P-LP, pH 4.5, LR 40:1
20 min at 105 °C
(heating rate: as rapid as possible)

V Scale



Example:

Exhaust:

Remaining liquor with new sample
60 min at 130 °C

Visual Determination
V = 0.25 - 8

Visual Determination
V-value 4

Typical V-values:
- Standard polyester = 0.5 – 1.0
- Deep dyeing = 1.0 – 2.0
- Carrier free = 2.0 – 4.0
- PTT = 2.0 – 4.0 – 8.0

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Carpet Solutions: Polyester

Dianix® dye selection for:

Dyeing at low temperature and on polyester fibers with low V-value as well as for printing

Dianix AC-E dyes

- Compatible, level-dyeing dyes for rapid and reliable dyeing
- Outstanding Right-First-Time performance through compatibility of dyes and state of-the-art accuracy in standardizing
- Low energy dyes

Dianix Yellow AC-E new

Dianix Red AC-E 01

Dianix Blue AC-E

Dianix E dyes

- Popular, well-established dyes
- Low energy dyes

Dianix Yellow E-3G

Dianix Red E-FB

Dianix Blue E-R 150%

Additonal Dianix dyes

- Higher energy dyes with good exhaustion at low dyeing temperature

Dianix Blue AM-77 150%

Dianix Turquoise S-BG

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Carpet Solutions: Polyester

Dianix® dye selection for:

Dyeing under HT conditions and for printing

Dianix K dyes

- Compatible, level-dyeing dyes for rapid and reliable dyeing
- Excellent on-tone build-up with critical shades and fibers
- Good light fastness and wet fastness properties

Dianix Orange K-3G

Dianix Blue K-FBL

Dianix Red K-2B

Dianix Black K-B

Dianix CC dyes

- Compatible, level-dyeing dyes for rapid and reliable dyeing
- Good wet fastness properties
- In most cases a diffusion accelerator is needed in printing application

Dianix Yellow CC

Dianix Red CC

Dianix Yellow Brown CC

Dianix Blue CC

Dianix S dyes

- Popular, well established high energy dyes
- Good wet fastness properties
- In most cases a diffusion accelerator is needed in printing application

Dianix Yellow S-3G

Dianix Blue S-2G

Dianix Rubine S-2G 150%

Dianix Turquoise S-BG

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Carpet Solutions: Polyester

Dianix® dye selection for:

Dyeing under HT conditions and for printing

Dianix AM/HLA dyes

- Dye range with outstanding levels of light fastness
- In most cases a diffusion accelerator is needed in printing application

MAIN SELECTION	ADDITIONAL DYES
Dianix Yellow AM-G	Dianix Yellow AM-42
Dianix Red AM-B	Dianix Red AM-86
Dianix Blue AM-R	Dianix Blue AM-77 150%
Dianix Black HLA-E	

Dianix Micro Liquid dyes

- High-energy liquid dye range for printing
- Standardized in continuous dyeing and printing
- Suitable for digital printing with higher nozzle fineness, e.g. 76 dpi

Dianix Yellow 3G liq	Dianix Blue BG liq
Dianix Red BEL liq	Dianix Black HSL liq 90%

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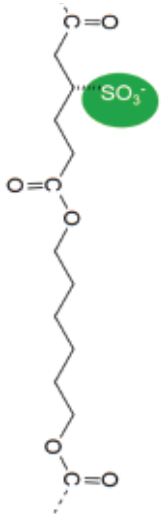
Carpet Solutions: Cationic Dyeable Polyester

Cationic Dyeable Polyester fibers used in carpets

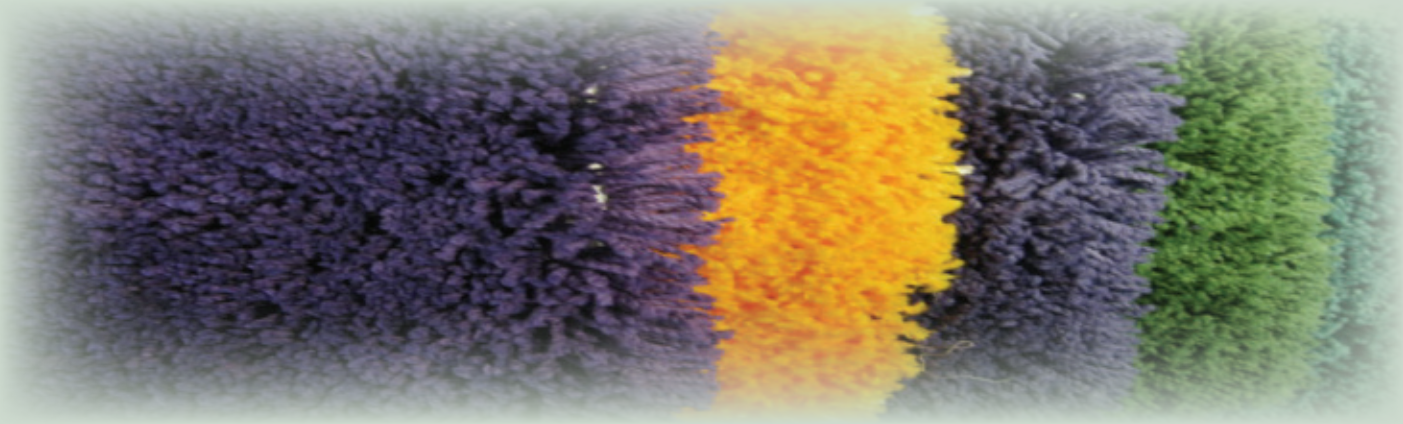
Cationic Dyeable Polyester fibers

CRYSTAL STRUCTURE



PROPERTIES

MP (°C)	265°C
Tg (°C)	60-70
Settable	yes
Elasticity	low
Dyeing temperature (°C)	100 to120



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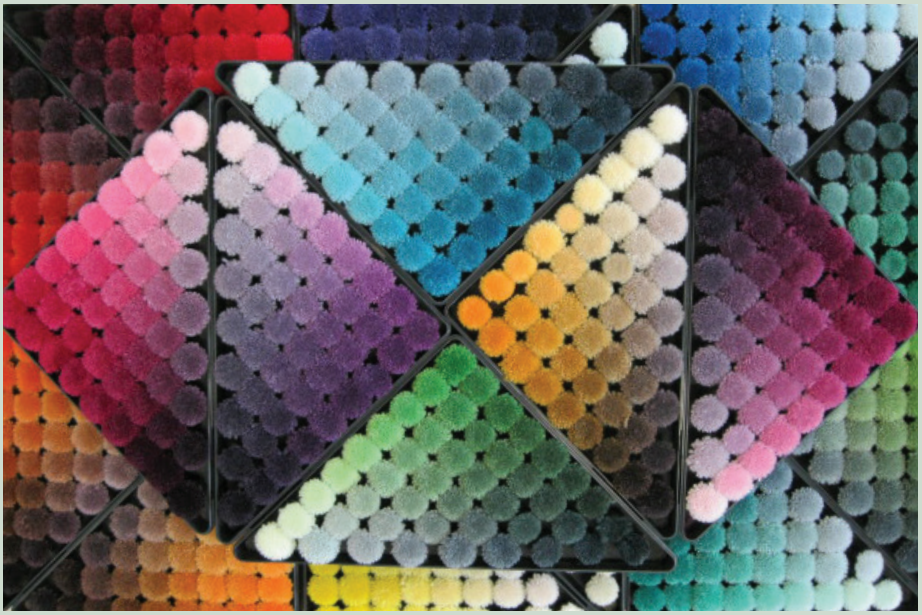
Carpet Solutions: Cationic Dyeable Polyester

Properties of Cationic Dyeable Polyester fibers (CDP)

- CDP is an anionic modified polyester fiber that forms a salt bondage with cationic dyes like Astrazon® dyes
- Due to the modification of the fiber with anionic groups the polymer structure is more open, so that the affinity for disperse dyes is higher than to regular polyester fibers
- Dependent on the fiber fineness cationic dyes show very good or limited light fastness
  - Light fastness on a 3.3 dtex CDP fiber = 6-7
  - Light fastness on a 1 dtex CDP fiber = 4-5
- Reduced light fastness of cationic dyes on CDP is related to the missing ability of quenching excitation energy
- Most brilliant shades possible
- Soft handle of the carpet
- Multicolor effects in blends with PET
- Excellent wet fastness and color blocking effect



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Carpet Solutions: Cationic Dyeable Polyester

Astrazon® dye selection for:

Dyeing and printing of Cationic Dyeable Polyester fibers (CDP)

Astrazon Yellow 8GSL 200%*	Clear greenish yellow, specialty dye with highest LF
Astrazon Yellow 7GLL 200%	Clear greenish yellow with high lightfastness
Astrazon Golden Yellow GL-E 200%	Economical golden yellow for standard combination
Astrazon Red GTLN micro 200%	Economical yellowish red for standard combination with highest steam-, pH and dyebath stability
Astrazon Red GL-N 300%*	Neutral red, specialty dye with highest LF in the market
Astrazon Red FBL 200%	Clear bluish red for use in standard combination
Astrazon Blue F2RL 200%	Clearest blue, specialty dye with highest steam-, pH- and dyebath stability
Astrazon Blue FGRL micro 200%*	Clear blue component for standard combinations, good steam-pH- and dyebath stability
Astrazon Blue FGGL 300%	Greenish blue for standard combinations
Astrazon Blue BG micro 200%	Clear blue component, limited steam-, pH- and dyebath stability, suitable only for deep shades
Astrazon Black FDL 200%	Basic Green 4 free black, good steam-, pH-, dyebath stability

* Dye combination for the highest LF

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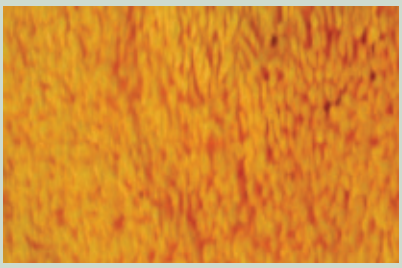
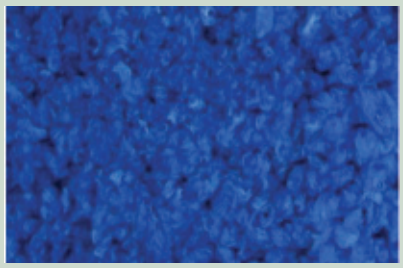
Carpet Solutions: Cationic Dyeable Polyester

Trichromatic dyes, as self-shade and in combination, including auxiliaries and process parameter



0.5 g/l
Astrazon® Golden Yellow GL-E 200%

0.5 g/l
Astrazon Red FBL 200%



0.5 g/l
Astrazon Blue FGRL micro 200%

0.072 g/l	Astrazon Golden Yellow GL-E 200%	
0.22 g/l	Astrazon Red FBL 200%	
0.28 g/l	Astrazon Blue FGRL micro 200%	
2 g/l	Sera® Sperse M – IW	pH 5
2 g/l	Sera Wet C-NR	Steaming time
10 g/l	Sera-Gal P-EW	10 min

0.32 g/l	Astrazon Yellow 8GSL 200%	
0.02 g/l	Astrazon Red FBL 200%	
0.2 g/l	Astrazon Blue FGRL micro 200%	
2 g/l	Sera Sperse M – IW	pH 5
2 g/l	Sera Wet C-NR	Steaming time
10 g/l	Sera-Gal P-EW	10 min

0.06 g/l	Astrazon Golden Yellow GL-E 200%	
0.04 g/l	Astrazon Red FBL 200%	
0.07 g/l	Astrazon Blue FGRL micro 200	
2 g/l	Sera Sperse M – IW	pH 5
2 g/l	Sera Wet C-NR	Steaming time
4 g/l	Sera-Gal P-EW	10 min

0.2 g/l	Astrazon Yellow 8GSL 200%	
0.2 g/l	Astrazon Red FBL 200%	
0.14 g/l	Astrazon Blue FGRL micro 200%	
2 g/l	Sera Sperse M – IW	pH 5
2 g/l	Sera Wet C-NR	Steaming time
6 g/l	Sera-Gal P-EW	10 min

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Committed to Sustainability

At DyStar, our products and services help customers worldwide reduce costs, shorten lead times and meet stringent quality and ecological specifications.

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